

Week 15

(A) $60 - 2q = 30 \Rightarrow q = 15 \Rightarrow p = 45 \Rightarrow \pi = 45 \times 15 - 30 \times 15 = 225 = PS$

$CS = 15 \times \frac{15}{2} = 112.5 \quad TS = 225 + 112.5 = 337.5 \quad WL = 112.5$

(B) $60 - q = 30 \Rightarrow q = 30 \Rightarrow \pi = 30 \times \frac{30}{2} = 450 \quad CS = 0 \quad TS = 450 \quad PWL = 0$

(C) $\pi = p(q_1)q_1 + p(q_2)(q_2 - q_1) - TC(q_2)$

$= (60 - q_1)q_1 + (60 - q_2)(q_2 - q_1) - 30q_2 = q_1^2 - q_2^2 + 30q_2 + q_1q_2$

一階條件為 $-2q_1 + q_2 = 0 \quad -2q_2 + 30 + q_1 = 0 \Rightarrow q_1 = 10 \quad q_2 = 20$

對應價格為 $p_1 = 5 \quad p_2 = 40 \Rightarrow \pi = 50 \times 10 + 40 \times (20 - 10) - 30 \times 20 = 300$

$CS = (10 \times \frac{10}{2}) + (10 \times \frac{10}{2}) = 100 \quad TS = 100 + 300 = 400$

$PWL = 400 - 400 = 0$

(D) $\pi = p(q_1)q_1 + p(q_2)(q_2 - q_1) + p(q_3)(q_3 - q_2) - TC(q_3)$

$= (60 - q_1)q_1 + (60 - q_2)(q_2 - q_1) + (60 - q_3)(q_3 - q_2) - 30q_3$

$= -q_1^2 - q_2^2 - q_3^2 + 30q_3 + q_1q_2 + q_2q_3$

一階條件為 $-2q_1 + q_2 = 0 \quad -2q_2 + q_1 + q_3 = 0 \quad -2q_3 + 30 + q_2 = 0$

\Rightarrow 求解可得 $q_1 = 7.5 \quad q_2 = 15 \quad q_3 = 22.5$

對應價格為 $p_1 = 52.5 \quad p_2 = 45 \quad p_3 = 52.5$

$\Rightarrow \pi = 52.5 \times 7.5 + 45 \times (15 - 7.5) + 52.5 \times (22.5 - 15)$

$- 30 \times 22.5 = 337.5$